

REMARKS

Claims 1-21 are pending in the present application.

At the outset, Applicants would like to thank Examiner Hailey for the helpful and courteous discussion with their Representative on October 7, 2003. During this discussion the amendment set forth herein was discussed as it applies to the art of record. The content of this discussion is believed to be accurately reflected in the comments that follow.

Applicants would also like to thank Examiner Hailey for the indication that the previous rejections over the Pennington references have been withdrawn (paper number 8, page 2, paragraph 3) and that Claims 12 and 13 are allowable (paper number 8, page 6, numbered paragraph 7).

The rejection of Claims 1-11 and 14-21 under 35 U.S.C. §103(a) over Datta et al (U.S. 4,898,845) is traversed.

The present application provides, in part, a molten-salt catalyst for purifying particulate materials, which are contained in an exhaust gas emitted from an internal combustion engine of an automobile and contain carbon, and said catalyst comprising:

a solid support; and

a catalytic ingredient loaded on the solid support including at least one member selected from the group consisting of silver nitrate, alkali metal nitrate, alkaline-earth metal nitrate and rare-earth nitrate (see Claim 1).

In the present invention, the molten-salt catalyst oxidizes and purifies mainly carbon, which is contained in an exhaust gas in a combustion engine of an automobile, including a diesel engine (see paragraph [0010]). The molten salt (e.g., LiNO₃) melts at a temperature of

an exhaust gas and captures a solid component, which is primarily composed of carbon in particulate materials (PM). As shown in Figure 1, the molten salt has remarkable effects and functions to promote oxidation of carbon. Further, since carbon is oxidized simultaneously while being captured by the molten-salt catalyst, excellent purification ability is exhibited.

Datta et al disclose a catalytically active composition in which a molten salt (liquid phase) is disposed as a thin film on an internal surface area of a porous substrate and crystallites are dispersed in the molten salt. This disclosure is fundamentally different from the present invention.

First, in contrast to the present invention where the catalytic ingredient is selected from silver nitrate, alkali metal nitrate, alkaline-earth metal nitrate and rare-earth nitrate, Datta et al provide an innumerable quantity of alternative cation and anion combinations at column 3, lines 12-24. At no point do Datta et al provide any motivation, much less adequate motivation, to select a nitrate compound from the extensive list of suitable alternatives, nor the advantages obtained thereby. To underscore this lack of motivation, Applicants note that Datta et al do not provide any example in which a nitrate is used while the examples of the present application clearly demonstrate that the claimed nitrate-based molten catalysts are superior to oxide-based molten catalysts (also a viable option in Datta et al). Such a result is not suggested by the disclosure of Datta et al and, as such, absent the present specification the skilled artisan would have no reason to select a nitrate compound from the list of suitable alternatives disclosed by Datta et al.

Applicants further note that Datta et al is fundamentally different from the present invention in that the molten salt disclosed by Datta et al merely serves as a support substrate and is not actually disclosed as having oxidation activity. As stated previously, the present invention utilizes the oxidation activity of the molten salt itself to engender excellent

purification ability. In this vein, Applicants also note that Datta et al fail to disclose or suggest carbon purification from an exhaust gas. Accordingly, Datta et al fail to even realize the problem that the present invention seeks to solve, much less offer the solution.

In view of the foregoing, Applicants submit that Datta et al cannot affect the patentability of the presently claimed invention. Therefore, withdrawal of this ground of rejection is requested.

The rejection of Claims 1-3, 5, 6, 9, and 14-16 under 35 U.S.C. §103(a) over Weimer et al (U.S. 6,565,820) is obviated by amendment.

Weimer et al disclose that molten salt reactions are performed by supporting a molten salt on a particulate support and forming a fluidized bed of supported salt particles (see Abstract). In so doing, Weimer et al disclose that NO_x generation is suppressed by burning hydrocarbon fuel at low temperatures. Weimer et al also disclose that sulfur and halide are captured by the molten salt so that emission of SO_x and HCl can be suppressed.

As clearly set forth in the Abstract, specification, and claims, Weimer et al use gas as a reactant on molten salt. At no point do Weimer et al disclose or suggest the use of carbon (solid) as a reactant. Since Weimer et al use a gas as a reactant on a molten salt rather than a using carbon as a reactant, a fluidized bed is formed to increase the contact area. In contrast, the present invention provides for the capture of carbon by the molten salt with simultaneous oxidation and purification.

The aforementioned description, in particular the formation of a fluidized bed, clearly distinguishes the disclosure of Weimer et al from that of the present invention which provides a molten-salt catalyst for purifying particulate materials, which are contained in an exhaust gas emitted from an internal combustion engine of an automobile and contain carbon.

Specifically, Applicants note that the use of a fluidized bed would certainly not be practical for use in automobiles. In an internal combustion engine for automobiles, air is used for burning in order to obtain power energy from fuel. As such, a large amount of air is taken in and similarly a large amount of gas is emitted from the internal combustion engine. Therefore, the following two matters are needed for a device for purifying exhaust gases in an internal combustion engine for automobiles: (1) permit a large amount of exhaust gases to pass through the device without increasing system pressure, and (2) have a size that can be mounted on an automobile.

In the technical field of fluidized beds, it is necessary that a fluidized bed be formed from very fine particles and that the fluidized bed has a flow speed within a certain range. Accordingly, a certain pressure loss is generated when exhaust gases are brought into contact with the fluidized bed. Therefore, a fluidized bed would not be practical for an internal combustion engine based on the corresponding loss of pressure. Moreover, a fluidized bed device for purification of exhaust gas from an automobile would have to be rather large, so much so that it is not practical for mounting on an automobile.

Consequently, it is the inventive molten-salt catalyst that solves the very problems that plague the disclosure of Weimer et al. Applicants submit that absent the present disclosure, there would be no motivation to modify the fluidized bed of Weimer et al to obtain the claimed molten-salt catalyst for purifying particulate materials, which are contained in an exhaust gas emitted from an internal combustion engine of an automobile and contain carbon.

In view of the foregoing, Applicants request withdrawal of this ground of rejection.

Applicants submit that the application is now in condition for allowance, and early notification of such action is earnestly solicited.

Respectfully submitted,

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